MAGNETIC ADJUSTABLE TURNING LOOP

BACKGROUND OF THE INVENTION

[0001] This invention relates to an adjustable turning loop for a vehicle safety restraint system.

[0002] A safety belt system is typically anchored to a vehicle at three different locations around a vehicle passenger. Two anchors support the lap belt portion of a safety belt while a third anchor, a loop or D-ring, located at the approximate height of the shoulder of the passenger provides support for the shoulder belt portion of the safety belt. Due to varying sizes of passengers, manufacturers use assemblies known as adjustable turning loops, which allow the shoulder loop to be adjusted up or down to accommodate these differing sizes. The adjustable turning loop has a button or other actuator that locks and unlocks the adjustable turning loop, generally located near the loop.

[0003] Typically, the adjustable turning loop is located near a side of the vehicle. Recently, side curtain air bags that deploy downwardly from the top of a door frame of the vehicle have been developed. Due to the proximity of the actuator to this air bag, deployment of the air bag may inadvertently cause the adjustable turning loop to become unlocked and thereby allow the loop to move at a point in time when the loop should be secured. Manufacturers have overcome this problem by placing shields above the actuator to deflect the downwardly deploying air bag. These shields may be cosmetically unsightly and add cost to the safety restraint system.

[0004] A need therefore exists for an adjustable turning loop assembly that avoids inadvertent actuation during air bag deployment without adding significant cost.

SUMMARY OF THE INVENTION

[0005] The present invention comprises an adjustable turning loop that has a support for a vehicle safety restraint and a guide that permits movement of the support along the guide. Like existing vehicle restraint adjusters, the inventive adjustable turning loop has a lock, which secures the support at a position on the guide in the locked state and, when unlocked, allows movement of the support along the guide. In contrast to existing adjustable turning loops, however, the inventive adjustable turning loop only allows unlocking of the lock in a direction opposite of an anticipated deployment of the side curtain air bag. In this way, deployment of the air bag does not move the actuator of the adjustable turning loop from the locked position to the unlocked position.

[0006] The inventive adjustable turning loop accomplishes this feature through a magnetic actuator that selectively moves the lock between the locked state or the unlocked state. The magnetic actuator has both a locked position and an unlocked position. In contrast to other assemblies, the unlocked position of the magnetic actuator is above the locked position. Accordingly, downward movement of a deploying air bag does not move the magnetic actuator from its locked position. No shield is required because the inventive adjustable turning loop allows for the downward movement of the deploying air bag. A spring may further bias the magnetic actuator to stay in the locked position.

[0007] The adjustable turning loop may comprise a web guide mounted to a slide. The slide is slideably received on a rail. Moreover, the magnetic actuator

may be an electromagnet, which is controllable by a control unit by turning the magnetic actuator "on" and "off." In this way, the adjustable turning loop may be used with existing automated adjustable seatbelt systems.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

[0009] Figure 1 illustrates a side perspective view of the inventive adjustable turning loop assembly, showing magnetic actuator, slide and rail.

[0010] Figure 2 illustrates an exposed behind view of the adjustable turning loop of Figure 1 in the locked state.

[0011] Figure 3 illustrates the adjustable turning loop of Figure 2 in the unlocked state.

[0012] Figure 4 illustrates a latch of the invention in the locked position.

[0013] Figure 5 illustrates the latch of Figure 4 in the unlocked position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Figure 1 illustrates a side view of the inventive adjustable turning loop or more broadly vehicle safety restraint adjuster 10. Vehicle safety restraint adjuster 10 comprises vehicle safety restraint support 14, here a slide, which slideably mounts loop 50 for shoulder belt 54 on rail 18. Slide 14 is adjustable along the X-axis in an up and down direction like existing adjustable turning loop assemblies. However, in contrast to such assemblies, vehicle safety restraint adjuster 10 is

unlocked by moving button 66 (shown by dashed lines) in the direction of arrow A, an upward direction. Adjustable turning loop is locked by moving button 66 in the direction of arrow B. Accordingly, an air bag deploying from the window frame of a vehicle in the direction of arrow B only forces button 66 more towards its locked position. In addition, as shown in Figure 1, spring 42 is biased to maintain button 66 in the locked position.

[0015] The inner working of vehicle safety restraint adjuster 10 will now be explained with reference to Figures 2 and 3. Figure 2 illustrates vehicle safety restraint adjuster 10 in the locked state while Figure 3 illustrates the device in the unlocked state. In the locked state, button 66, which is mounted to arm 24, is held by spring 42 in locked position 26. Arm 24 is connected to button 62 on one end as shown in Figure 1 and supports magnet 38 at the other end as shown in Figure 2. Magnet 38 serves to hold up latch 58, which is made of a magnetic receptive material, through magnetic force. Latch 58 is pivotally mounted to slide 14. Magnet 38 may be an electromagnet, which is controlled by control unit 46 to be "on" or "off." Latch 58 serves to lock slide 14 in place by engaging teeth 62 of rail 18 as shown by cross-section in Figure 4. In this way, slide 14 is held at locked position 26 on rail 18. Moreover, downward movement of an air bag 100 in the direction of arrow B does not cause magnet 38 to change its position so that inadvertent unlocking of the adjustable turning loop may be avoided.

[0016] To unlock adjustable turning loop 10, as shown in Figure 1 and Figure 3, button 66 and consequently arm 24 is moved in the direction of arrow A, an upward direction. Thus, magnet 38 moves from locked position 26 to unlocked position 30, a position higher than locked position 26 and further away from latch 58. Upward movement of button 66 will cause slide 14 to be moved upward.

Consequently, while portion 59 of latch 58 will rise with slide 14, portion 61 of latch 58 will fall with gravity so as to disengage from teeth 62 of rail 18 as shown by cross-section in Figure 5. Slide 14 may accordingly be moved up or down along the X-axis. Following adjustment of slide 14 to a desired height, button 66 is released allowing spring 42 to draw arm 24 to locked position 26. It should be noted that in this particular embodiment, magnet 26 need not be in contact with latch 58 to hold latch 58 in place. There need only be sufficient magnetic force to suspend latch 58 in the locked position.

[0017] The aforementioned description is exemplary rather that limiting. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed. However, one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. Hence, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For this reason the following claims should be studied to determine the true scope and content of this invention.